
Pregnant Women and Listeriosis: Preferred Educational Messages and Delivery Mechanisms

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ABSTRACT

Objective: To characterize pregnant women's food safety practices, to evaluate the impact of existing educational messages on the risks and prevention of listeriosis, and to identify preferred delivery methods for educational initiatives.

Design: Eight focus group discussions conducted with pregnant women in 4 locations.

Setting: Focus group discussions led by moderators using a prepared moderator guide.

Participants: Purposeful sampling was used to select the 63 pregnant women who participated in this study. The focus groups were segmented by location and education level.

Phenomenon of Interest: Food safety knowledge and food-handling practices, food safety practices during pregnancy, attitudes toward listeriosis brochure, and preferred delivery methods.

Analysis: Focus group discussions were videotaped and audiorecorded. Detailed summaries of each discussion were prepared and systematically analyzed to identify common themes within and across groups.

Results: Participants were not aware of the risks of listeriosis and recommended practices for listeriosis prevention; thus, they were not taking precautions during their pregnancy to prevent listeriosis.

Conclusions and Implications: The study identified the need to develop educational materials on listeriosis targeted specifically to pregnant women and to partner with obstetricians

and other health care providers to deliver these materials to pregnant women.

KEY WORDS: foodborne illness, pregnant women, education, listeriosis

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INTRODUCTION

Consumption of food contaminated with *Listeria monocytogenes* can cause listeriosis, an uncommon but potentially fatal disease.¹ In the United States, approximately 2500 individuals contract listeriosis annually and become seriously ill, resulting in approximately 500 deaths per year.² Some individuals are considered "at risk" because they are more susceptible to listeriosis due to an underlying condition. At-risk populations include pregnant women and their unborn fetuses, neonates, seniors, and immunocompromised individuals.³ According to the Centers for Disease Control and Prevention (CDC), pregnant women are about 20 times more likely than the general population to contract listeriosis.⁴

Although *L. monocytogenes* can be transmitted through several routes, foods have been recognized as a primary route of transmission for the pathogen. The organism is highly resistant to adverse environmental conditions and can grow at refrigerator temperatures.⁵ Many ready-to-eat (RTE) foods such as hot dogs, deli meats, and soft cheeses have been associated with human listeriosis and are known to support the growth of *L. monocytogenes*.^{6,7}

Federal food safety agencies are finding it very useful to use a risk analysis framework to quantify food safety problems and identify strategies for addressing the problem. The risk analysis framework is made up of 3 parts: risk assessment, risk management, and risk communication.⁸ Federal food safety agencies have prepared an assessment of the relative risk to public health from foodborne *L. monocytogenes* for selected RTE foods⁹ and will develop an action plan to identify measures to reduce the risks of listeriosis.¹⁰ One component of this plan will be to educate consumers and health care

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providers on listeriosis prevention. Risk communication includes the process of communicating to the public the risks of foodborne illness and the actions that they can take to help reduce their risk.

Because pregnant women are more susceptible than others to contracting listeriosis, this subpopulation warrants special consideration with regard to communicating the risks of listeriosis and ways to mitigate these risks. The design of effective educational materials and programs requires an understanding of the current food safety knowledge, attitudes, and practices of pregnant women. Although some research has been conducted with the general population to characterize the food safety knowledge, attitudes, and practices of consumers,¹¹ limited research has been conducted specifically with pregnant women.

To provide information to inform the development of educational materials and programs for pregnant women on the risks and prevention of listeriosis, the authors conducted focus groups with expectant mothers. Many researchers have used focus groups to design educational programs with considerable success.¹²⁻¹⁵ Focus groups are particularly useful in studies such as this one in which the research is exploratory in nature because focus group data provide insight and direction into the topics of interest. However, focus group data cannot be generalized to the population because participants are not typically representative of the population and identical questions are not asked in each group.¹⁶ Thus, the findings reported here should be considered in a qualitative frame of reference.

The purpose of the focus groups was to characterize participants' food safety concerns, knowledge, and practices, particularly changes made during their pregnancy; to solicit participants' opinions about existing educational messages on the risks of listeriosis and prevention measures; and to gain insights about participants' preferences for delivery methods for future educational initiatives.

STUDY DESCRIPTION

Study Design

Two focus groups were conducted in each of 4 cities (Manchester, NH; Cedar Rapids, Ia; Raleigh, NC; and Salt Lake City, Utah), for a total of 8 focus groups. These cities were selected to provide geographic diversity; 1 city was selected from each of the 4 Census regions (Northeast, Midwest, South, and West). As suggested by Greenbaum, the groups were segmented by education to increase the homogeneity of the groups.¹⁷ In each city, one group was conducted with high school-educated individuals, and one group was conducted with college-educated individuals.

A purposeful sampling approach was employed. Local market research facilities in each city recruited pregnant women for the focus group discussions by advertising in local newspapers and contacting individuals from their databank of

subjects. Interested subjects were screened for eligibility. To qualify, subjects had to meet the following criteria: be 18 years of age or older and at least 12 weeks pregnant at the time of the focus group, prepare food at home at least 3 times a week, and eat RTE meat and poultry products.

Participants

Each focus group consisted of 7 or 8 participants, for a total of 63 participants. Each group included women who were expecting their first child and women who were in a second or subsequent pregnancy. Each group included a variety of ages and stages of pregnancy. The racial mix of each group was similar to the area in which the group was conducted.

Consistent with the recruitment eligibility criteria, all participants were at least 12 weeks pregnant at the time of the focus group and prepared food at home at least 3 times a week. The average age was 28, ranging from 18 to over 36 years old. Sixty-four percent of participants had other children (ie, not their first pregnancy). Eighty-seven percent of participants were white, 6% were black, 5% were Native American or Alaskan Native, and 2% were Asian or Pacific Islander.

Focus Group Discussion

Prior to the full-scale study, a mini focus group was conducted with 3 pregnant women to test our focus group procedures and the draft moderator guide. The pretest findings were used to refine the moderator guide.

RTI International's (RTI's) Committee for the Protection of Human Subjects, which serves as RTI's Institutional Review Board, reviewed and approved the study protocol. Prior to participating in the focus group discussion, each participant signed an informed consent form agreeing to participate in the study and to have the discussion videotaped and audiorecorded.

The focus groups were conducted at local market research facilities in each location in the fall of 2000. Each focus group was moderated by two experienced moderators. The moderators used a moderator guide (Table) to serve as an outline that provided structure for the focus group discussion. First, participants were asked about their general food safety knowledge and food-handling practices. Then participants discussed food safety information that they had received since becoming pregnant and any changes made in food handling, preparation, and consumption since becoming pregnant. Participants then evaluated an educational brochure on listeriosis prevention developed by the US Department of Agriculture, Food Safety and Inspection Service (FSIS). As suggested by Doak and colleagues, participants were asked about the usefulness, attractiveness, comprehension, relevancy, acceptability, and persuasiveness of the brochure.¹⁸ The focus groups concluded with a discussion of preferred delivery methods for reaching pregnant women with information on listeriosis. Several other topics were discussed by participants but are not presented here for brevity. Each focus group discussion

Table. Moderator Guide: Topics Discussed in the Focus Groups

Introduction
Informed consent
Purpose of discussion
How the discussion will work
Participant introductions
Food Safety Knowledge and Behaviors
Concerns about foodborne illness
Perceived causes of foodborne illness*
Names of bacteria that cause foodborne illness
Foods more likely to cause foodborne illness*
Level of knowledge about food safety
Sources for food safety information*
Food Safety and Pregnancy
Subpopulations more likely to contract foodborne illness
How foodborne illness might impact the fetus*
Information received from health care provider on food safety since becoming pregnant
Information on food safety during pregnancy from other sources
Changes made in food handling, preparation, and consumption since becoming pregnant
Consumption and preparation of hot dogs, deli meats, and deli salads during pregnancy
Storage practices for hot dogs and deli meats*
Knowledge and use of open product dates on hot dogs and deli meat*
Food Safety Messages on Listeriosis
Evaluate USDA, FSIS brochure on listeriosis prevention
Usefulness
Attractiveness
Comprehension
Relevancy
Acceptability
Persuasiveness
Suggestions to improve brochure
Delivery Mechanisms
How to reach pregnant women with information on listeriosis prevention
Sources for prenatal care information
Use of warning labels on ready-to-eat meat and poultry products*
Messages to emphasize in educational materials
Anticipated changes in food consumption and handling during pregnancy*

*This topic was discussed by the focus group participants but is not presented in the article for brevity.

FSIS indicates Food Safety and Inspection Service; USDA, US Department of Agriculture.

was professionally videotaped and audiorecorded by the market research facility staff.

Analysis

Because the study was exploratory in nature, observational forms and independent coders were not employed as part of our analysis procedures. The moderators reviewed the transcriptions of the audiotapes and the videotapes to prepare an

8- to 9-page detailed summary of each focus group. The detailed summaries were then systematically analyzed to identify common themes within and across groups and any exceptions to these trends. Because the number of participants in each subgroup (location and education level) is small, we did not analyze the results by subgroup.

FOCUS GROUP FINDINGS

Food Safety Concerns, Knowledge, and Practices

Most participants reported that they were somewhat or not very concerned about getting foodborne illness from food prepared at home. Although the majority of participants reported following good hygiene practices and practices to prevent cross-contamination, many did not refrigerate leftovers immediately or use a food thermometer to check for the safe internal temperature of meat and poultry as recommended by FSIS.¹⁹

Despite their confidence in their ability to safely prepare food at home, when asked, most participants described themselves as being only somewhat knowledgeable about food safety and safe handling practices. Participants had heard of the bacteria *Escherichia coli* and *Salmonella* but were unfamiliar with *L. monocytogenes*. Some participants correctly identified children, seniors, and the immunocompromised as at-risk populations for foodborne illness, but most were not aware that pregnant women are highly susceptible to foodborne illness.

Food Safety during Pregnancy

Few participants reported receiving information about food safety from their health care providers since becoming pregnant, and none had received information specifically on listeriosis. Several participants recalled reading about food safety in books and magazines on prenatal care, and several participants in the high school-educated groups had received information from nutritionists with the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Most participants said that they had not made any changes in how they handle food since becoming pregnant because they were careful *before* becoming pregnant; however, some participants said that they became more cautious since having children. Some participants continued to eat “high-risk” foods during their pregnancy, particularly raw homemade cookie dough, soft cheeses, and dishes containing raw or undercooked eggs. A few participants said that they stopped eating sushi and rare meat during pregnancy for food safety reasons.

Preparation of Hot Dogs and Deli Meats

L. monocytogenes may be associated with RTE meat and poultry products such as hot dogs and deli meats and can grow at refrigerator temperatures.^{5,7} Additionally, RTE foods are often

consumed without reheating. FSIS recommends that at-risk persons reheat hot dogs and deli meats to steaming hot before eating to destroy any *L. monocytogenes* that might be present.²⁰

Most participants reported eating hot dogs during pregnancy. Some participants recalled reading or hearing that hot dogs should not be consumed cold from the package but did not relate this specifically to pregnant women. Nearly all participants reported following the recommended practice of reheating hot dogs to steaming hot, although many reported doing so for food quality, not food safety concerns. Nearly all participants reported eating deli meats during pregnancy; however, the vast majority did not reheat deli meats to steaming hot prior to eating as a food safety precaution.

Evaluation of FSIS Listeriosis Brochure

Participants evaluated the 2-color, 4-panel educational brochure developed by FSIS, entitled "Listeriosis and Food Safety Tips." (A copy of the brochure can be found at <http://www.fsis.usda.gov/OA/pubs/lmtips.pdf>.) Participants generally liked the brochure, describing it as easy to understand, very informative, and "to the point."

Participants in both the high school-educated and college-educated groups were not familiar with the information on listeriosis, and most were surprised and concerned by the information presented. Specifically, participants were surprised to learn that pregnant women are at increased risk of contracting listeriosis. Additionally, they were unaware that at-risk individuals should reheat deli meats, a precaution that the vast majority of participants were not currently taking.

Effective Messages

Participants' suggestions for improving the brochure are summarized below.

Develop a brochure specific to each at-risk population. The brochure evaluated by the focus group participants was targeted to all at-risk populations. Participants said that a brochure targeted specifically to pregnant women would be more effective in reaching pregnant women.

Use a title with a warning tone. The brochure evaluated by the focus group participants was titled "Listeriosis and Food Safety Tips." Participants thought that this title would be ineffective in capturing pregnant women's attention because most are already familiar with safe food-handling practices. Participants suggested that written educational materials have titles with "warning" tones to attract attention, for example, "Listeriosis...Is it Harmful to You?"

Provide detailed information on listeriosis. Participants wanted to know more about listeriosis but cautioned against a brochure with lengthy text. Participants wanted to know the following: *L. monocytogenes* sources, how individuals are infected, specific prevention measures, testing and

treatment measures, and whether listeriosis can be transmitted through breast milk.

Include morbidity and mortality statistics. Most participants said that statistics on illnesses and deaths attributed to listeriosis can help illustrate the seriousness of the illness. Participants suggested that statistics be presented in simple terms, for example, say "1 in 4 die" instead of "25% die," as stated in the brochure.

Emphasize the potential risk to pregnant women and fetuses. Participants said that, although words such as "miscarriage" and "stillbirth" are scary for pregnant women, it is important that those at risk know the possible outcomes of the illness. These words can get pregnant women's attention and illustrate the seriousness of the illness.

Preferred Delivery Methods

Health care providers. Participants in both the high school-educated and college-educated groups agreed that the best way to inform pregnant women about listeriosis is through obstetricians and other health care providers. They suggested including materials on listeriosis prevention in the package of information received at the first prenatal care visit. One participant said, "Every pregnant woman needs to get this brochure at her first visit." Participants, even those for whom this was a second or subsequent pregnancy, said that they read everything included in the prenatal information package, including numerous brochures on topics such as exercise, diet, and nutrition.

Additionally, some participants suggested that health care providers personally give educational materials to patients and discuss listeriosis prevention with them. These participants said that the seriousness of the illness demands special attention by health care providers. One participant stated, "I think it's the doctor's responsibility to say something because it is such a risk, specifically for pregnant women." These participants believed that this direct approach would be more effective at reaching pregnant women with information on listeriosis prevention than only including educational materials in the prenatal informational packet.

Books, magazines, and Web sites on prenatal care. Participants said that they actively sought prenatal care information from books, magazines, and Web sites on prenatal care. Some participants said that they obtained *more* information from these sources than from their health care providers. Although most participants reported primarily using books and magazines as information sources, some participants, particularly those in the college-educated groups, viewed the Internet as a reliable information source.

Media coverage. Participants said that the general population, not just at-risk individuals, needs to be aware of the risks of listeriosis and prevention measures because individuals not

at risk may prepare food for at-risk individuals. Participants believed that media coverage, such as television news and public service announcements, would be the most effective way to increase awareness among the general population.

Other delivery methods. Participants suggested the following approaches for reaching pregnant women with information on listeriosis: display brochures and posters in physicians' (eg, obstetricians, pediatricians, and family practitioners) offices, day-care centers, and grocery stores; provide information in prenatal care classes; provide information in schools; and disseminate information via WIC clinics.

DISCUSSION

This study identified the need to educate pregnant women about the risks of listeriosis and the recommended practices for listeriosis prevention. Participants suggested that educators develop materials targeted specifically to pregnant women. They advised that educational materials be informative but concise.

Participants were surprised that their obstetricians or other health care providers had not provided them with information on listeriosis prevention as a component of their prenatal care. They suggested that health care providers deliver this information as a brochure in the package of prenatal information provided at the first prenatal care visit. Some participants said that the seriousness of the illness warrants special attention and that health care providers should personally give expectant mothers the brochure and discuss it with them.

Other researchers have concluded that food safety education is most likely to be effective if the educational materials are targeted toward at-risk populations and behaviors.^{21,22} Because pregnant women are an at-risk group, educational efforts that target pregnant women and their specific needs and concerns are warranted.

Limitations

Although the study provided valuable information for educators, several aspects of the focus group methodology could have potentially biased responses. First, because of the interactive format of the group discussion, participants' responses may be biased by previous discussion. When analyzing focus group discussions, care must be given to considering the internal consistency of responses.¹⁶ Second, there is the potential for self-selection bias because purposeful sampling, not a list of random telephone numbers, was employed to recruit eligible participants. Finally, because this was not a random sample, care should be taken in generalizing the study results to all pregnant women. Despite these limitations, the focus group methodology employed for this study is appropriate for this type of exploratory research.

Future Research

FSIS and other agencies used the findings from this and other research to develop an educational campaign targeted to pregnant women. Further research is needed to measure whether knowledge and use of the recommended practices for listeriosis prevention among pregnant women have subsequently increased since this initiative was implemented in the fall of 2001. Additionally, future research is needed to examine whether there are differences in food safety practices and attitudes among pregnant women for different subgroups (eg, education level, location, or culture). This information would help to target educational initiatives to those subgroups that exhibit risky behaviors.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The results of this study have a number of implications for designing educational efforts to prevent listeriosis in pregnant women. First, our study identified the need to develop educational materials targeted specifically to pregnant women and to partner with obstetricians and other health care providers to deliver these materials to pregnant women. In the fall of 2001, FSIS partnered with the International Food Information Council Foundation, US Food and Drug Administration, CDC, and the Association of Women's Health, Obstetric, and Neonatal Nurses to develop a listeriosis educational campaign and materials, including a patient tear sheet, targeting pregnant women.²³ This tear sheet incorporated many of the suggestions offered by participants such as providing more details on listeriosis and explaining the risk of listeriosis to pregnant women, fetuses, and neonates.

Encouraging obstetricians to provide patients with information on listeriosis prevention may be difficult. Focus group research with physicians suggests that physicians do not generally provide patients at high risk for foodborne illness with preventive information on food safety.²⁴ Physicians deem foodborne illness as less important than other topics, such as heart health, smoking, and drug and alcohol use. The American Medical Association and food safety regulatory agencies are partnering to educate physicians about foodborne illness. A product of this partnership is a physician primer on foodborne illness.²⁵

Second, our study findings suggest that educational efforts should not be limited to health care providers. Pregnant women rely on many sources for prenatal care information, including books, magazines, and the Internet. Publishers of these and other sources could be encouraged to include information on prevention of listeriosis.

Finally, our study identified the need to educate the general population about listeriosis because individuals not at risk may prepare food for at-risk individuals. Although awareness of *L. monocytogenes* among the general population has increased, awareness is still much lower than that of *Salmonella*

and *E. coli*.²⁶ Also, recent outbreaks of listeriosis underscore the urgency for educating the general population about listeriosis.²⁷⁻²⁹

In conclusion, targeted educational initiatives are needed to educate pregnant women about the risks of listeriosis and ways to mitigate these risks. Federal food safety agencies and other organizations are working together to educate pregnant women about listeriosis prevention. Such educational efforts are an important component of the risk management plan for *L. monocytogenes*.

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Strategies for Nutrition Education and Behavior Change

The 6-step procedural model proposed by Isobel Contento and described in “Using a Theory-Driven Approach to Design a Professional Development Workshop,” *J Nutr Educ Behav.* 2003;35:312–318, is from a forthcoming textbook by Contento titled *Strategies for Nutrition Education and Behavior Change*.

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